# Trends in early-onset GI cancers in Puerto Rico

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I have no financial disclosures
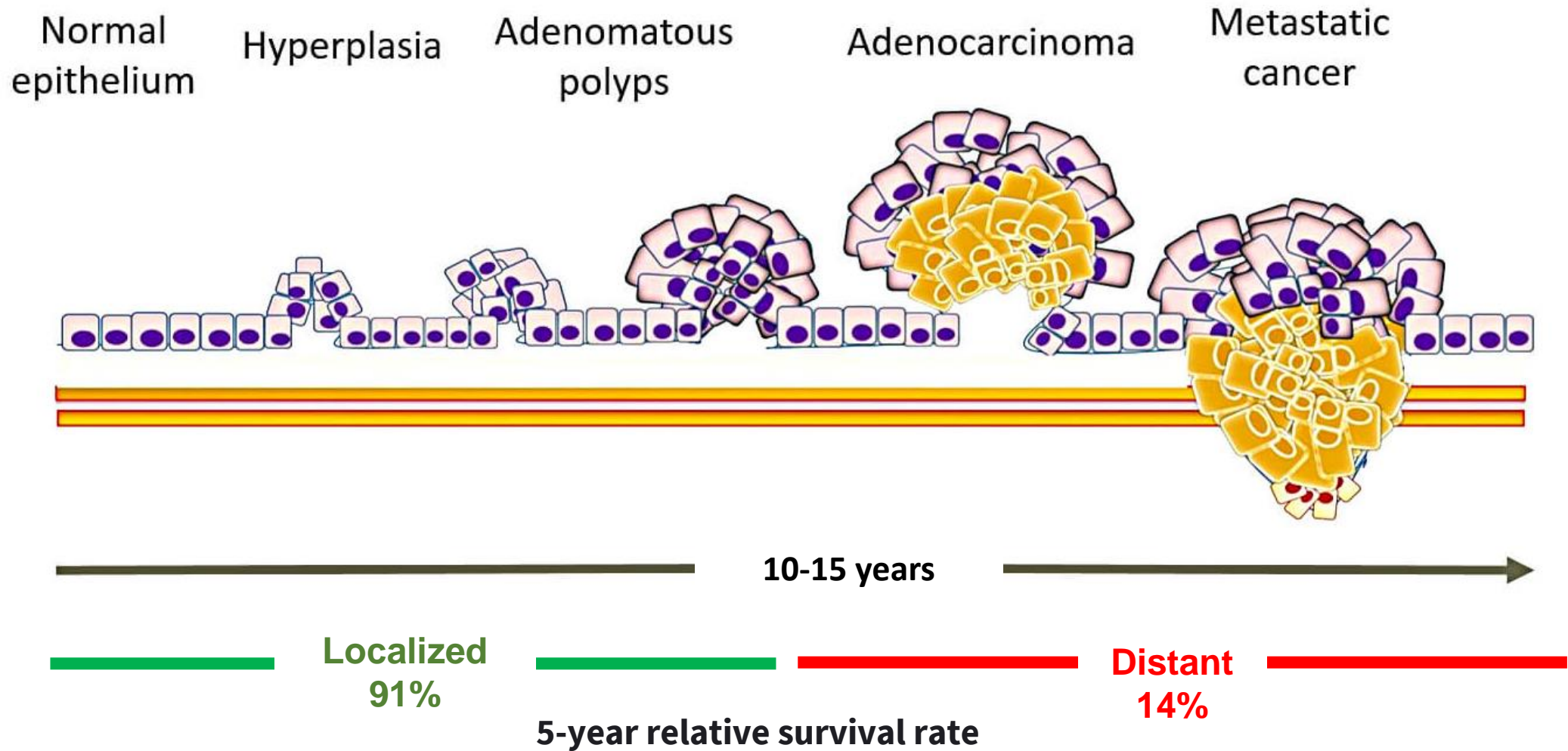
# Early-onset cancer

o Diagnosis of early-onset cancers, defined as cancers in adults aged 18-49 years, are increasing in developed countries

o Cancers commonly seen in older people are now being diagnosed in younger adults, for example pancreatic, breast, stomach, and colorectal cancers (Bergquist et al. 2019; Araghi et al. 2019)

    o Cancer incidence varies by age group, sex, and race/ethnicity

**Urgent research is needed to understand the multifactorial reasons for the increasing trend in the diagnosis of early-onset cancer cases**

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# Colorectal cancer



Normal epithelium · Hyperplasia · Adenomatous polyps · Adenocarcinoma · Metastatic cancer

10-15 years

Localized 91%

Distant 14%

5-year relative survival rate

# Hispanics and Colorectal Cancer

o Colorectal cancer (CRC) is the leading cause of cancer death among Hispanic men and women living in Puerto Rico

o In the mainland U.S., Cubans and Puerto Ricans have disproportionately higher CRC incidence and mortality rates than other USH subgroups (Pinheiro et al. 2017, Miller et al. 2018)

o Although CRC incidence trends have been declining overall, the incidence in individuals younger than 50 years (early-onset CRC) have been increasing consistently since the mid-1990s

o Early-onset CRC incidence is expected to increase by more than 140% by 2030 (Bailey et al. 2015)

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# Analysis of early-onset colorectal cancer incidence trends

o CRC trends overall reflect most cases that occur in older age groups, masking trends in young adults

o We compared early-onset and average-onset CRC incidence trends during a 20-year period (2000-2019) between Hispanics living in Puerto Rico (PRH) and other racial/ethnic groups in the U.S., including non-Hispanic Whites (NHW), Non-Hispanics Blacks (NHB), Hispanics (USH), and Non-Hispanic Asian or Pacific Islanders (NHAPI)

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# Demographic and clinical characteristics for incident CRC by race/ethnicity, 2000-2019

- US mainland Hispanics have the highest percentage of early-onset CRC cases

- A higher percentage of PR and US mainland Hispanic men are diagnosed with early-onset CRC

- NHB and USH had the highest percentage of cases diagnosed at advanced stages

| Characteristic | PRH n= 29,761 (%) | NHW n= 457,761 (%) | NHB n= 68,685 (%) | NHAPI n= 51,294 (%) | USH n= 67,878 (%) |
|---|---|---|---|---|---|
| Age group | | | | | |
| 20-49 | 2,613 (8.8) | 37,881 (8.3) | 8,512 (12.4) | 6,545 (12.8) | 11,419 (16.8) |
| 50+ | 27,148 (91.2) | 419,880 (91.7) | 60,173 (87.6) | 44,749 (87.2) | 56,459 (83.2) |
| Sex | | | | | |
| Male | 16,447 (55.3) | 240,269 (52.5) | 34,490 (50.2) | 27,044 (52.7) | 37,026 (54.5) |
| Female | 13,314 (44.7) | 217,492 (47.5) | 34,195 (49.8) | 24,250 (47.3) | 30,852 (45.5) |
| Location | | | | | |
| Right colon | 10,847 (36.4) | 197,090 (43.1) | 31,281 (45.5) | 16,144 (31.5) | 25,225 (37.2) |
| Left colon | 9,315 (31.3) | 121,742 (26.6) | 19,702 (28.7) | 17,655 (34.4) | 19,648 (28.9) |
| Colon, NOS | 1,348 (4.5) | 11,701 (2.6) | 2,508 (3.7) | 1,024 (2.0) | 1,925 (2.8) |
| Rectum | 8,251 (27.7) | 127,228 (27.8) | 15,194 (22.1) | 16,471 (32.1) | 21,080 (31.1) |
| Stage at diagnosis | | | | | |
| Localized | 11,705 (39.3) | 184,313 (40.3) | 24,503 (35.7) | 18,767 (36.6) | 24,242 (35.7) |
| Regional | 11,939 (40.1) | 172,254 (37.6) | 24,593 (35.8) | 20,632 (40.2) | 26,476 (39.0) |
| Distant | 3,962 (13.3) | 85,608 (18.7) | 16,899 (24.6) | 9,917 (19.3) | 14,566 (21.5) |
| Unknown | 2,155 (7.2) | 15,567 (3.4) | 2,687 (3.9) | 1,972 (3.8) | 2,582 (3.8) |

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# Age-standardized CRC Incidence Rates (per 100,000) by race/ethnicity, 2000 to 2019

o Age-standardized incidence rates were calculated for each racial/ethnic group using the direct method (2000 US population)

|          | PRH    | NHW    | NHB    | NHAPI  | USH    | US overall |
|----------|--------|--------|--------|--------|--------|------------|
| Overall  | 48.11  | 46.19  | 52.63  | 38.49  | 40.61  | 45.42      |
| 20-49    | 11.99  | 11.85  | 12.10  | 9.33   | 9.30   | 11.02      |
| 50+      | 105.19 | 100.45 | 116.68 | 84.58  | 90.11  | 99.80      |
| Male     | 59.27  | 53.53  | 62.47  | 46.22  | 48.38  | 52.88      |
| 20-49    | 12.84  | 13.34  | 12.73  | 10.34  | 9.55   | 12.04      |
| 50+      | 132.67 | 117.05 | 141.09 | 102.92 | 109.76 | 117.42     |
| Female   | 39.13  | 39.62  | 45.35  | 32.26  | 34.38  | 39.03      |
| 20-49    | 11.24  | 10.34  | 11.54  | 8.45   | 9.05   | 10.01      |
| 50+      | 83.22  | 85.90  | 98.80  | 69.88  | 74.41  | 84.89      |

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# Average annual percent change (AAPC) in early-onset CRC incidence by race/ethnic group 2000-2019

o Average annual percent change (AAPC) was estimated using the Joinpoint Regression Program from SEER

| | PRH | NHW | NHB | NHAPI | USH |
|---|---|---|---|---|---|
| | AAPC (95% CI) | AAPC (95% CI) | AAPC (95% CI) | AAPC (95% CI) | AAPC (95% CI) |
| Overall | 2.7* (2.0 to 3.5) | 2.0 (1.8 to 2.2) | 0.6* (0.2 to 1.0) | 0.1 (-0.3 to 0.6) | 2.3* (1.6 to 3.0) |
| Sex | | | | | |
| Male | 3.0* (2.1 to 4.0) | 2.2* (1.9 to 2.4) | 0.4 (-0.1 to 1.0) | 0.2 (-0.6 to 1.0) | 2.0* (1.6 to 2.5) |
| Female | 2.5* (1.6 to 3.4) | 1.5* (1.0 to 2.0) | 0.8* (0.1 to 1.5) | 0.1 (-0.5 to 0.7) | 2.2* (1.7 to 2.7) |
| Stage at diagnosis | | | | | |
| Localized | 3.5 (-2.7 to 10.0) | 0.5* (0.1 to 1.0) | 0.1 (-0.7 to 0.9) | -1.5* (-2.5 to -0.5) | 0.6 (-0.1 to 1.3) |
| Regional | 2.1* (0.7 to 3.5) | 2.0* (1.7 to 2.4) | 0.4 (-0.2 to 1.1) | 0.3 (-0.4 to 1.1) | 2.2* (1.5 to 2.9) |
| Distant | 4.9* (3.7 to 6.1) | 3.7* (3.4 to 4.1) | 1.4* (0.7 to 2.0) | 1.3* (0.4 to 2.1) | 3.4* (2.6 to 4.2) |

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# Average annual percent change (AAPC) in average-onset CRC incidence (age 50+) by race/ethnic group 2000-2019
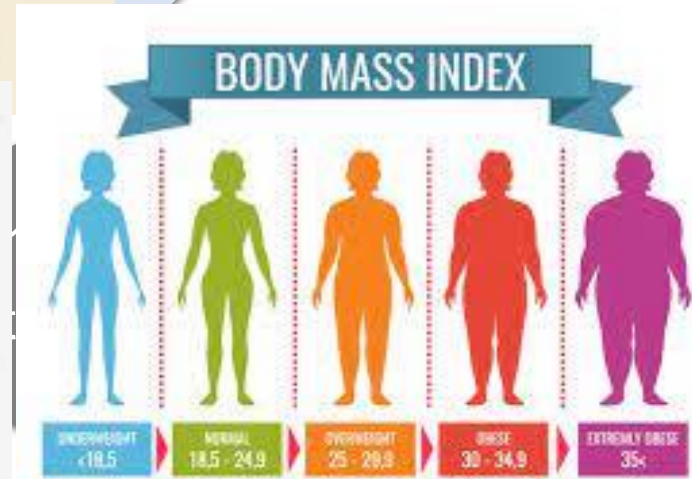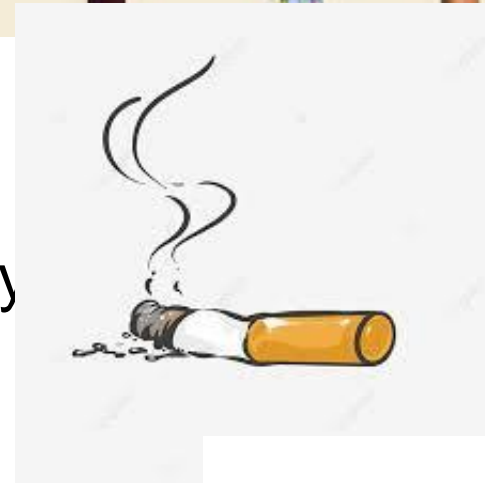
○ Average annual percent change (AAPC) was estimated using the Joinpoint Regression Program from SEER

| | PRH | NHW | NHB | NHAPI | USH |
|---|---|---|---|---|---|
| | AAPC (95% CI) | AAPC (95% CI) | AAPC (95% CI) | AAPC (95% CI) | AAPC (95% CI) |
| Overall | -0.8 (-1.6 to 0.0) | -3.1* (-3.6 to -2.5) | -2.7* (-3.2 to -2.2) | -2.9* (-3.2 to -2.7) | -2.1* (-2.4 to -1.8) |
| Sex | | | | | |
| Male | -0.2 (-1.0 to 0.6) | -3.3* (-3.6 to -3.0) | -2.6 (-3.5 to -1.6) | -2.8* (-3.1 to -2.6) | -2.2* (-3.2 to -1.1) |
| Female | -1.2* (-1.9 to -0.4) | -3.0* (-3.5 to -2.5) | -3.2* (-3.5 to -2.8) | -3.1* (-3.5 to -2.8) | -2.1* (-2.3 to -1.9) |
| Stage at diagnosis | | | | | |
| Localized | 0.3 (-1.6 to 2.3) | -3.4* (-4.1 to -2.7) | -3.0* (-3.7 to -2.4) | -2.8* (-4.2 to -1.4) | -2.7* (-3.4 to -1.9) |
| Regional | -0.9 (-2.7 to 0.8) | -3.2* (-3.6 to -2.7) | -3.6* (-3.9 to -3.3) | -3.7* (-5.7 to -1.7) | -2.3* (-2.7 to -1.9) |
| Distant | 1.0 (-1.2 to 3.3) | -1.6* (-2.1 to -1.1) | -1.9* (-2.3 to -1.6) | -1.9* (-2.4 to -1.5) | -1.2* (-1.6 to -0.8) |

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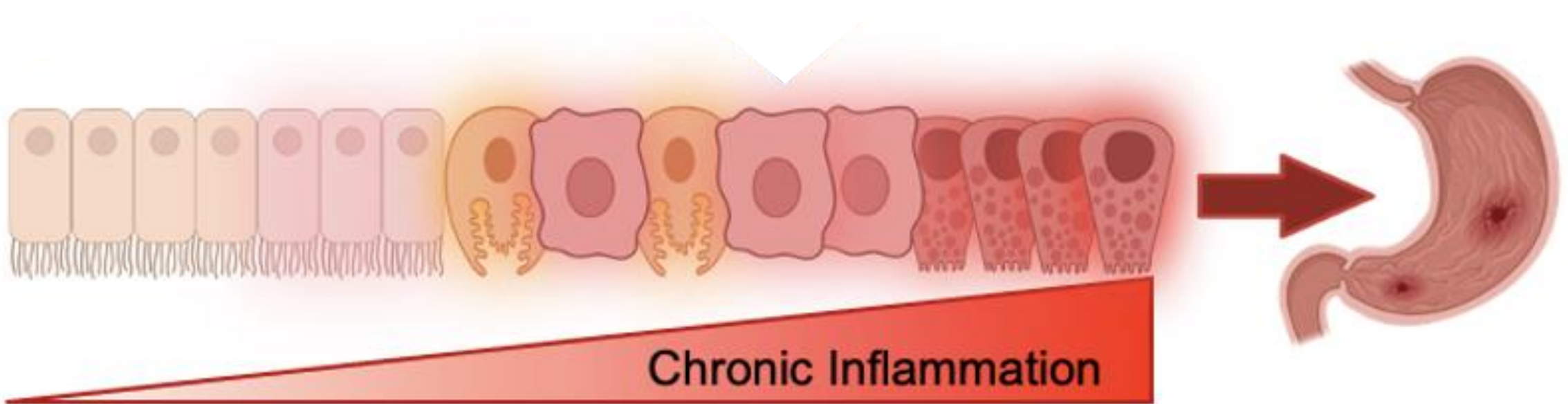UNIVERSIDAD DE PUERTO RICO

# What are the factors contributing to the early-onset colorectal cancer disparities among PR Hispanics?

o Known modifiable risk factors

o Genetics and epigenetics
  o A higher percentage of Amerindian ancestry was associated with early-onset CRC
  o A higher percentage of African ancestry was associated with rectal tumors

(Perez-Mayoral et al. 2019)

BODY MASS INDEX

# Gastric cancer



Chronic Inflammation

| Normal mucosa | Atrophic Gastritis | Intestinal Metaplasia | Dysplasia | Cancer |

**5-15 years**

**Localized 70%**

**Distant 6%**

**5-year relative survival rate**

# Hispanics and Gastric Cancer

o In 2023, approximately 26,500 individuals will be diagnosed with gastric cancer, and 11,130 patients will succumb to this malignancy in the U.S.

o Gastric cancer is more commonly diagnosed in Hispanics, non-Hispanic Blacks, Native Americans, and Asian/Pacific Islanders than it is in non-Hispanic whites

o The median age of diagnosis is 68 years; however, an increase in gastric cancer incidence rates has been reported among individuals younger than 50 years

o Gastric cancer is the 15th most commonly diagnosed malignancy in Puerto Rico
   o It is the 7th and 9th leading cause of cancer-related death among men and women, respectively

# Analysis of gastric cancer incidence

o Compared gastric cancer incidence trends during a 15-year period (2002-2016) between Hispanics living in Puerto Rico (PRH) and other racial/ethnic groups in the U.S., including non-Hispanic Whites (NHW), Non-Hispanics Blacks (NHB), Hispanics (USH), and Non-Hispanic Asian or Pacific Islanders (NHAPI)

Cruz-Cruz et al. 2022

# Demographic and clinical characteristics for incident gastric cancer by race/ethnicity, 2002-2016

- The percentage of cases of cases <50 and >50 are similar to NHW

- Could not include location because there was a lot of missing data
  - Very low number of cardia tumors among PR Hispanics

| Characteristic | PRH<br>n = 4202 (%) | NHW<br>n = 43,164 (%) | NHB<br>n = 10,414 (%) | NHAPI<br>n = 11,548 (%) | USH<br>n = 14,041 (%) |
|---|---|---|---|---|---|
| Age group | | | | | |
| <50 | 276 (6.6) | 2897 (6.7) | 1167 (11.2) | 1280 (11.1) | 2856 (20.3) |
| 50+ | 3926 (93.4) | 40,267 (93.3) | 9247 (88.8) | 10,268 (88.9) | 11,185 (79.7) |
| IQ50 (IQ25, IQ75) | 72 (63, 81) | 71 (61, 80) | 68 (57, 78) | 59 (71, 80) | 52 (65, 76) |
| Sex | | | | | |
| Male | 2527 (60.1) | 28,879 (66.9) | 6184 (59.3) | 6638 (57.5) | 8207 (58.5) |
| Female | 1675 (39.9) | 14,285 (33.1) | 4230 (40.6) | 4910 (42.5) | 5834 (41.5) |
| Stage at diagnosis | | | | | |
| Localized | 1343 (32.0) | 10,132 (23.5) | 2365 (22.7) | 2945 (25.5) | 2648 (18.9) |
| Regional | 1414 (33.7) | 12,214 (28.3) | 3016 (28.9) | 3716 (32.2) | 4106 (29.2) |
| Distant | 811 (19.3) | 16,527 (38.3) | 3964 (38.1) | 3791 (32.8) | 6018 (42.9) |
| Unknown | 634 (15.0) | 4291 (9.9) | 1069 (10.3) | 1096 (9.5) | 1269 (9.0) |

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# Annual percent change (APC) in gastric cancer incidence by racial/ethnic group from 2002-2016

| | PRH | | NHW | | NHB | | NHAPI | | USH | |
|---|---|---|---|---|---|---|---|---|---|---|
| | n | APC (%) | n | APC (%) | n | APC (%) | n | APC (%) | n | APC (%) |
| **Overall** | 4,202 | -2.8* (-4.8 to -0.7) | 43,164 | -1.6* (-1.9 to -1.4) | 10,414 | -2.9* (-3.5 to -2.4) | 11,548 | -3.7* (-4.2 to -3.1) | 14,041 | -2.3* (-2.7 to -1.9) |
| **Age group** | | | | | | | | | | |
| <50 | 276 | **4.2 (-2.0 to 10.9)** | 2,897 | -0.5 (-1.4 to 0.4) | 1,167 | -2.1* (-3.0 to -1.2) | 1,280 | -2.6* (-4.0 to -1.3) | 2,856 | 0.4 (-0.3 to 1.1) |
| 50+ | 3,926 | -3.2* (-5.3 to -1.1) | 40,267 | -1.7* (-2.0 to -1.5) | 9,247 | -3.0* (-3.6 to -2.4) | 10,268 | -3.8* (-4.4 to -3.2) | 11,185 | -2.7* (-3.1 to -2.3) |
| **Gender** | | | | | | | | | | |
| Male | 2,527 | -2.6 (-5.3 to 0.3) | 28,879 | -1.7* (-2.1 to -1.4) | 6,184 | -3.2* (-3.9 to -2.4) | 6,638 | -3.7* (-4.3 to -3.1) | 8,207 | -2.5* (-3.1 to -1.9) |
| Female | 1,675 | -3.5* (-5.8 to -1.1) | 14,285 | -1.9* (-2.3 to -1.5) | 4.230 | -2.8* (-3.7 to -1.9) | 4,910 | -3.7* (-4.4 to -3.0) | 5,834 | -2.2* (-2.8 to -1.6) |
| **Stage at diagnosis** | | | | | | | | | | |
| Localized | 1,343 | -5.1* (-6.3 to -3.9) | 10,132 | -0.6* (-1.2 to 0.0) | 2,365 | -3.2* (-4.2 to -2.1) | 2,945 | -3.9* (-5.1 to -2.6) | 2,648 | -2.2* (-3.4 to -1.0) |
| Regional | 1,414 | **1.6* (0.0 to 3.2)** | 12,214 | -3.3* (-3.8 to -2.7) | 3,016 | -4.3* (-5.4 to -3.1) | 3,716 | -5.3* (-6.1 to -4.5) | 4,106 | -3.9* (-4.6 to -3.2) |
| Distant | 811 | -6.2* (-8.1 to -4.3) | 16,527 | -0.3 (-0.8 to 0.1) | 3,964 | -1.3* (-2.2 to -0.3) | 3,791 | -2.3* (-3.2 to -1.5) | 6,018 | -1.0* (-1.7 to -0.3) |

# What are the factors contributing to early-onset gastric cancer disparities among PR Hispanics?

o H. pylori

- o *H. pylori* seroprevalence in Puerto Rico is 33.0% (n=528), which is comparable to the rates reported in the mainland U.S. (30.7% ) (Gonzalez-Pons et al. 2018, Grad et al. 2012)

o GIM prevalence

- o The GIM prevalence rate in Puerto Rico is 10.7% (4,707 of 43,993 upper endoscopy pathologies), which is higher than the pooled rates reported for the mainland U.S. (4%) (Cruz-Cruz et al. 2021, Altayar et al. 2020)
- o *H. pylori* was detected in 26.9% of the GIM cases
- o Most pathology reports lacked information regarding the high-risk subtypes (99.6%) and extension (71.2%)

# What are the factors contributing to early-onset gastric cancer disparities among PR Hispanics?

o Genetics and epigenetics
  o Preliminary pro-inflammatory SNP distribution between among PR Hispanics
    o Percentage of pro-inflammatory vs. non pro-inflammatory alleles at IL-1β : rs143627, IL-6 : rs1800795, and IL-10 : rs1800871.
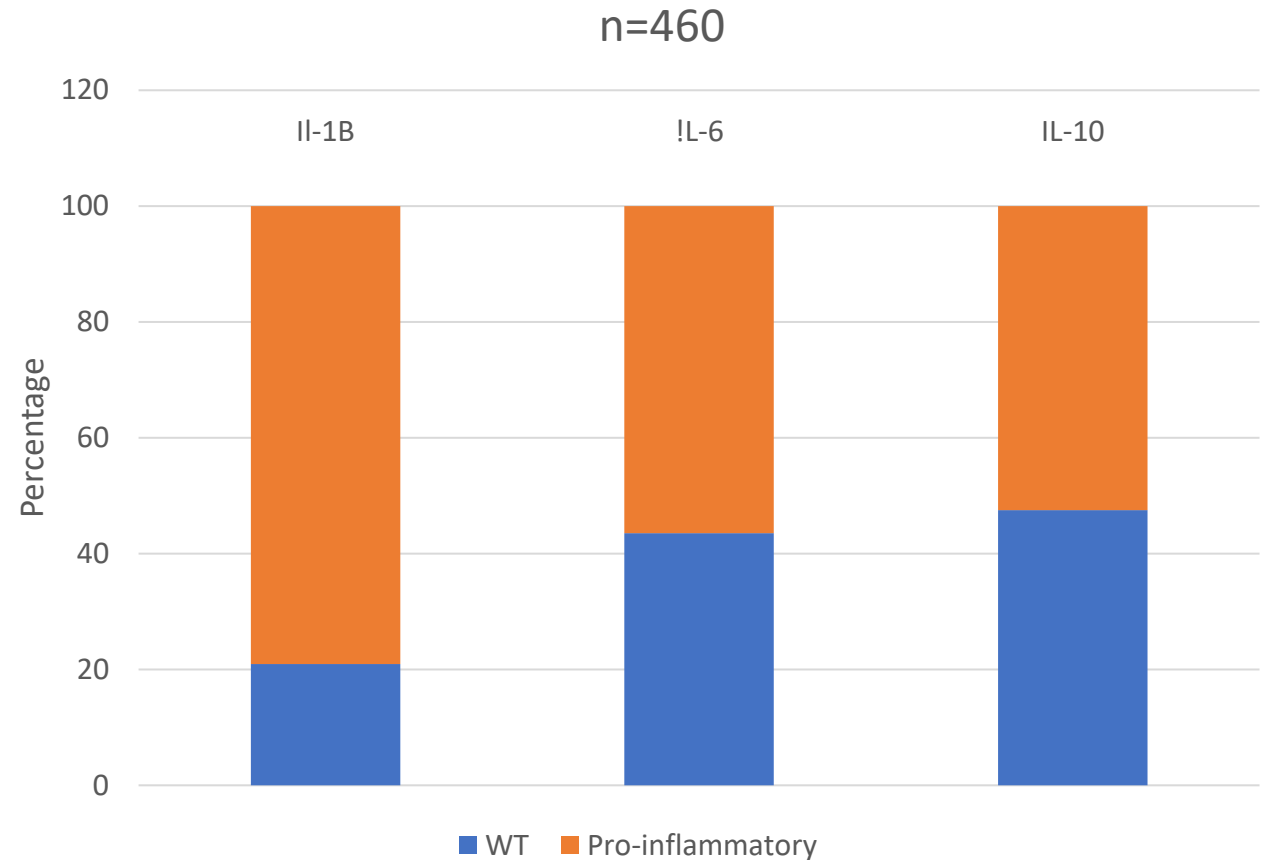
# What are the factors contributing to the early-onset gastrointestinal cancer disparities among PR Hispanics?

| Non-modifiable factors | Modifiable factors |
|---|---|
| Genetic admixture | Obesity |
| Other predisposing genetic factors | Diet |
| Epigenetics | Microbiome/*H. pylori* |
| | Smoking & Drinking |
| | Stress |

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PR / Male and female / 20-49 / Localized: 3 Joinpoints

Legend:
- Observed
- 2000-2008 APC = 8.59*
- 2008-2011 APC = -11.00
- 2011-2016 APC = 13.90*
- 2016-2019 APC = -9.97

Y-axis: Age-Adjusted Rate

X-axis: Year of diagnosis 2000-2019 JP